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AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application.

LISTING OF CLAIMS

1-66. (canceled)

67. (new) A method of processing a metal casting comprising:

providing a mold for receiving a molten metal therein, the mold including a core;

pre-heating the mold to a temperature of at least about the heat treatment temperature for the metal;

pouring the molten metal into the mold to form a casting; and

at least partially heat treating the casting within the mold.

68. (new) The method of claim 67, wherein at least partially heat treating the casting comprises introducing a heated fluid into at least one opening in the mold.

69. (new) The method of claim 67, further comprising allowing the molten metal to at least partially solidify prior to heat treating.

70. (new) The method of claim 67, further comprising:

positioning the casting at a first position with x, y, and z axes of the casting oriented in a known first orientation with a first plurality of core openings in alignment with a first plurality of nozzles; and

applying heat to the casting with the first plurality of nozzles to at least partially dislodge the core from the casting.

71. (new) The method of claim 70, further comprising:

positioning the casting at a second position with x, y, and z axes of the casting oriented in a known second orientation different from the first orientation and with a second plurality of core openings in alignment with a second plurality of nozzles; and

applying heat to the casting with the second plurality of nozzles.

72. (new) The method of claim 67, wherein at least partially heat treating the casting comprises:

maintaining the casting at a known position;

moving a plurality of nozzles to a first nozzle position about the casting;

applying heat to the casting with the nozzles to at least partially heat treat and dislodge the core from the casting;

moving at least one of the plurality of nozzles to a second nozzle position; and

further applying heat to the casting with the nozzles in the second nozzle position.

73. (new) The method of claim 67, wherein the metal of the casting includes aluminum, and wherein the mold is pre-heated to a temperature of from about 400 to about 600°C.

74. (new) The method of claim 67, wherein heat treating the metal of the casting comprises moving the casting through a pressurized chamber, drawing a flow of oxygen gas through the mold to promote combustion of a combustible binder material of the mold, and heating the casting with the combustion of the binder and oxygen gas.

75. (new) The method of claim 67, further comprising transferring the casting to a heat treatment line, arresting cooling of the casting, maintaining the casting at a temperature at or above a process control temperature, and thereafter heat treating the casting.

76. (new) A method of processing a metal casting comprising:

providing a mold with a core, the mold including at least one access opening;

pouring a molten metal into the mold;

allowing the poured metal to at least partially solidify to form a casting; and

introducing a heated fluid through the at least one access opening to at least partially heat treat the casting within the mold.

77. (new) The method of claim 76, wherein the heated fluid is a gas or an oil.

78. (new) The method of claim 76, further comprising maintaining the temperature of the casting at or above a process control temperature for the metal of the casting.

79. (new) The method of claim 78, wherein the process control temperature is the temperature below which for every one minute of time the temperature of the casting decreases, more than one minute of heat treatment is required to attain the desired properties of the casting.

80. (new) A method of processing a metal casting comprising:

providing a mold;

pouring a molten metal into the mold;

maintaining the temperature of the metal at or above a process control temperature for the metal;

allowing the metal to at least partially solidify while maintaining the temperature of the metal at or above the process control temperature; and

at least partially heat treating the casting within the mold.

81. (new) The method of claim 80, wherein the process control temperature is the temperature below which for every one minute of time the temperature of the casting

decreases, more than one minute of heat treatment is required to attain the desired properties of the casting.

82. (new) The method of claim 80, further comprising pre-heating the mold.

83. (new) The method of claim 80, further comprising pre-heating the mold to a temperature of at least about the heat treatment temperature for the metal of the casting.

84. (new) A system for processing a metal casting comprising:

a first heat source for pre-heating a mold to a temperature of at least about the heat treatment temperature for a molten metal to be cast;

a pouring station for pouring the molten metal into the pre-heated mold;

a process control temperature station upstream from said pouring station, said process control temperature station including a second heat source for maintaining the metal at or above a process control temperature as the metal at least partially solidifies; and

a heat treatment station in which the at least partially solidified metal is at least partially heat treated.

85. (new) The system of claim 84, wherein said heat treatment station comprises at least one nozzle initially mounted in alignment with a plurality of openings in the mold for applying a fluid to the mold.

86. (new) The system of claim 84, wherein said heat treatment station comprises a radiant energy source for heating the mold and casting therewithin.

87. (new) The system of claim 84, wherein said heat treatment station comprises an induction energy source for heating the mold and casting therewithin.

88. (new) The system of claim 84, wherein said heat treatment station comprises a pressurized chamber for drawing a flow of oxygen gas through the mold for reacting and combusting with a binder material to at least partially heat treat the castings within the mold as the binder material and oxygen gas are combusted.

89. (new) A method of processing a metal casting comprising:

providing a permanent metal die for receiving a molten metal therein, the metal die including at least one access opening;

pre-heating the die to a temperature of at least about the heat treatment temperature for the metal of the casting;

pouring the molten metal into the die while the die is at the pre-heated temperature; and

controlling the temperature of the die.

90. (new) The method of claim 89, wherein pre-heating the die comprises introducing a heated fluid into the at least one access opening.

91. (new) The method of claim 89, wherein the die is pre-heated to a temperature of from about 400 to about 600°C.

92. (new) The method of claim 89, further comprising arresting cooling of the at least partially solidified metal prior to heat treating.

93. (new) The method of claim 92, wherein arresting the cooling of the at least partially solidified metal comprises introducing a heated fluid into the at least one access opening in the die.

94. (new) The method of claim 93, wherein the temperature of the heated fluid is from about 500 to about 550°C.

95. (new) A method of processing a metal casting comprising:

providing a permanent metal die for receiving a molten metal therein, the metal die including a sand core;

pouring a molten metal into the die;

controlling the temperature of the die to maintain the temperature of the metal at or above a process control temperature for the metal;

allowing the metal to at least partially solidify while maintaining the temperature of the metal at or above the process control temperature for the metal; and

at least partially heat treating the casting within the die.

96. (new) The method of claim 95, wherein the process control temperature is the temperature below which for every one minute of time the temperature of the casting decreases, more than one minute of heat treatment is required to attain the desired properties of the casting.

97. (new) The method of claim 95, wherein the process control temperature is the temperature below which for every one minute of time the temperature of the casting decreases, at least about four minutes of heat treatment is required to attain the desired properties of the casting.

98. (new) The method of claim 95, further comprising quenching the heat treated casting.

99. (new) The method of claim 98, wherein quenching the casting comprises applying water to the casting.

100. (new) The method of claim 98, wherein quenching the casting comprises applying air to the casting.

101. (new) The method of claim 98, wherein quenching the casting comprises applying water to the casting followed by applying air to the casting.

102. (new) A system for processing a metal casting comprising:

a first heat source for pre-heating a permanent metal die to a pre-heating temperature of at least about the heat treatment temperature for a metal to be cast;

a pouring station for pouring the metal in a molten state into the pre-heated die;

a process control temperature station downstream from said pouring station, said process control temperature station including a second heat source for maintaining the poured metal at or above a process control temperature as the poured metal at least partially solidifies to form the casting; and

a heat treatment station in which the casting is at least partially heat treated.

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